

REMARKS

Favorable consideration of this application is respectfully requested in view of the following remarks.

Applicants have amended claims 1, 4, 8 and 16, canceled claims 2, 3, and 9-13 and added claim 21. Accordingly claims 1, 4-8 and 14-21 remain pending for consideration.

The Official Action includes an objection to the drawings, because reference characters "20" and "30" have both been used to designate electronic components. Paragraph 0022, line 8 has been amended to read "Various electronic components 20 (only one component 20 [[30]] is shown in FIG. 1)..." In light of this amendment, Applicants believe that the objection to the drawing has been obviated and respectfully ask that that the objection to Fig. 1 be removed.

Art Rejections

Claims 1 and 2 were rejected as being anticipated by the disclosure in U.S. Patent No. 6,275,374 to Shin et al. Claim 1 has been amended to recite the subject matter set forth in Claims 2 and 3. As Claim 3 was not rejected as being anticipated by the disclosure in Shin et al., the anticipatory rejection of Claim 1 is not longer applicable.

Claim 1 recites that the heat-dissipation device at issue here comprises, *inter alia*, a heat conductive terminal connected to the circuit board at a position proximate to the electronic component so that the heat of the electronic component is transferred or conducted to the heat conductive terminal, with the heat conductive terminal being connected to a protective case at a first end portion to thermally conduct the heat to the protective case. Claim 1 has been amended to also recite

that the second end portion of the heat conductive terminal is inserted into an insertion hole formed in the circuit board so as to be connected to an inner wall of the insertion hole. In addition, Claim 1 recites “a first heat conductive layer formed on the inner wall of the insertion hole”, and “at least one second heat conductive layer disposed on or within the circuit board and connected to the first heat conductive layer so that the heat conducted or transmitted from the electronic component to the at least one second heat conductive layer is further conducted to the heat conductive terminal.”

Claims 3-7 stand rejected over Shin et al. in combination with the disclosure in U.S. Patent No. 4,729,061 to Brown. Shin et al. discloses an electronic device provided with one or more spacers that protect an electronic component on a motherboard from vibration and impact. In the embodiment shown in Fig. 2, one end of the spacer 40 is connected to a plate 52 while the other end is connected to a bottom cover 84 of the housing 80. The Official Action observes that the disclosed spacer 40 corresponds to the claimed heat conductive terminal. Shin et al. also mentions in connection with the Fig. 1 embodiment that the spacer may penetrate the board.

The Official Action correctly notes that Shin et al. lacks disclosure of a first heat conductive layer formed on the inner wall of the insertion hole that receives one end of the spacer and also lacks disclosure of at least one second heat conductive layer disposed on or within the circuit board and connected to the first heat conductive layer so that the heat conducted or transmitted from the electronic component to the at least one second heat conductive layer is further conducted to

the heat conductive terminal. To address this deficiency, the Official Action relies upon the disclosure in Brown.

Brown discloses a PC board package that includes a plurality of PC boards bonded together to form a composite. Referring to Fig. 1, the composite includes two laminates or boards 10, 30 that are bonded together to form the composite. The composite also includes pins 44 that are received in pin holes 42. As discussed in column 4, lines 48-52 of Brown, once the laminates 10, 30 have been bonded together, the holes 42 are drilled through both laminates 10, 30 and then the pins 44 are inserted into the holes to provide electrical communication to the circuit traces formed on the laminates.

The Official Action seems to suggest that the pins 44 disclosed in Brown constitute heat conductive terminals and that Brown thus teaches that it would have been obvious to modify the heat dissipating device disclosed in Shin et al. to include the structure disclosed in Brown. However, it is respectfully submitted that if one were somehow motivated to apply the disclosure in Brown to the device described in Shin et al., the result would not be that which is defined in Claim 1 as the invention.

As understood, the claim rejection under 35 U.S.C. § 103(a) is based on the view that Brown would have provided motivation for one of ordinary skill to construct a circuit board having the claimed first and second heat conductive layers because Brown shows a hole 42 provided with a liner that is in contact with a second metallic layer connected to an electrical component. However, it is significant to note that the pins 44 disclosed in Brown are not heat conductive terminals which have one end portion connected to a housing. Rather, the pins 44 are specifically provided for purposes of conducting electricity among the traces on the laminates 10, 30 that are

joined together as discussed in lines 48-52 of column 4. One of ordinary skill would therefore not have viewed Brown's disclosure of holes 42 provided with a liner as a teaching that the same holes should be provided in the device of Shin et al. for purposes of receiving the spacers 40. To the extent an ordinarily skilled artisan would have been motivated to incorporate the disclosure in Brown into the device described in Shin et al., Brown merely discloses that the circuit board disclosed in Shin et al. can be replaced with a composite of several individual circuit boards bonded together and provided with connecting pins 44 extending through holes in the composite board that electrically connect the traces on the individual boards.

Quite significantly, Brown is not at all concerned with improving heat dissipation by providing a heat conductive terminal connected to a protective case to thermally conduct heat to the protective case and having an end portion inserted into an insertion hole formed in the circuit board so as to be connected to an inner wall of the insertion hole, with a first heat conductive layer formed on the inner wall of the insertion hole and at least one second heat conductive layer disposed on or within the circuit board and connected to the first heat conductive layer so that the heat conducted or transmitted from the electronic component to the at least one second heat conductive layer is further conducted to the heat conductive terminal. Thus, the disclosure in Brown would not have motivated one to modify the device disclosed in Shin et al. so that the holes through which extend Shin et al.'s spacers 40 are provided with a first heat conductive layer and so that such heat conductive layer is connected to at least one second heat conductive layer disposed on or within the circuit board so that the heat conducted or transmitted from the electronic

component to the at least one second heat conductive layer is further conducted to the heat conductive terminal.

For at least these reasons, Applicants respectfully submit that the claimed invention recited in Claim 1 is patentably distinguishable over a combination of the disclosures in Shin et al. and Brown. Withdrawal of the rejection of Claim 1 and allowance of such claim are earnestly solicited.

Claim 5 further patentably distinguishes over a combination of Shin et al. and Brown. Claim 5 recites that "at least one second heat conductive layer includes a top heat conductive layer, at least one intermediate heat conductive layer, and a bottom heat conductive layer, that are disposed on a top surface, an intermediate region, and a bottom surface of the circuit board, respectively." For reasons similar to those discussed above, one of ordinary skill would not have viewed Brown's disclosure of positioning connecting pins 44 in holes 42 of a composite circuit board, wherein the holes are provided with a liner and the composite board includes various traces, as a teaching that the spacers 40 disclosed in Shin et al. should be positioned in holes provided with a first heat conductive layer connected to a top heat conductive layer, at least one intermediate heat conductive layer, and a bottom heat conductive layer. As noted, the construction disclosed in Brown is not intended to improve heat dissipation, but rather is specifically provided to establish an electrical connection between the traces on the individual circuit boards. For at least this reason, the rejection of Claim 5 should be withdrawn and this claim allowed.

For essentially the same reasons as given above for Claim 1, the rejections of Claims 8, 16 and 21 should be withdrawn. These claims are further distinguishable for other reasons.

Independent claim 8 requires that the second heat conductive layer and the second electrically conductive layer disposed on the same surface or region are made of the same material, are formed simultaneously with each other, and are electrically separated from each other. Shin et al and Brown do not teach a heat conductive layer and an electrically conductive layer that are electrically separated from each other. The Official Action states that Roessler teaches simultaneously forming the heat conductive and electrically conductive layers. However, while Roessler discloses a separate heat conductive path, it does not teach simultaneously forming the heat conductive path with an electrically conductive path using the same material on the same layer as set forth in Claim 8. Column 2, lines 36-41 of Roessler merely mentions that they may be made of copper and formed during manufacture of the board. Therefore, Claim 8 would not have been obvious in view of Shin, Brown and Roessler. For at least these reasons, the rejection of Claim 8 should be withdrawn and Claim 8 allowed.

Claim 16 recites that the first and second protrusions are made of the same material and are formed integrally with each other. New Claim 21 depending, from Claim 16, defines that the first and second protrusions are formed by bending parts of the second end portion. The first and second protrusions of Chobot et al. referred to by the Examiner are formed by the solder fill 21. The solder fill 21 is filled after inserting the end portion of the pin. Therefore, Chobot et al does not teach the first and second protrusions as recited in new Claims 16 and 21.

Claims 4, 6, 7, 14, 15 and 17 to 20 depend from the above independent claims and are thus distinguishable from the cited references for at least the same reasons discussed above in connection with the independent claims. Accordingly,

Applicants respectfully request that the rejections of Claims 4, 6, 7, 14, 15 and 17-20 be withdrawn and these claims allowed.

It is believed that this application is in condition for allowance and such action is earnestly solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

BUCHANAN INGERSOLL PC

Date: February 6, 2006

By: Matthew L. Schneider
Matthew L. Schneider
Registration No. 32,814

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620